

PS300 Tribomaterials Evaluated at 650 °C by Bushing Test Rig

A new facility has been developed to test the tribological behavior (friction and wear) of PS300 solid lubricant bushings at high temperatures. PS300 is a commercially available solid lubricant invented at the NASA Glenn Research Center. It can be prepared as a plasma spray coating or as a free-standing powder metallurgy component, designated PM300. PS300 and PM300 composites are designed to lubricate sliding components at temperatures above the capability of today's best oils, greases, and solid lubricants. One of the primary applications being pursued for PM300 is the development of bushings for use in high-temperature machinery. Examples include inlet guide vane bushings for gas turbines and conveyors, and bearings for industrial furnaces and ovens. Encouraging preliminary field trials indicate that PS300 and PM300 lubricant materials have been commercialized successfully in several industrial applications. However, the lack of laboratory performance data has hindered further commercialization especially for new applications that differ significantly from the established experience base.



PM300 bushing loaded in bushing test rig.

The purpose of the newly developed bushing test rig will be to determine the performance characteristics of PM300, and other materials, under conditions closely matching intended applications. The data will be used to determine engineering friction and wear rates and to estimate the life expectancy of bushings for new applications. In the new rig, the bushing is loaded against a rotating shaft inside a furnace enclosure (see the preceding photograph). Loads can vary from 5 to 200 N, speeds from 1 to 400 rpm, and temperatures from 25 to 800 °C. Furnace temperature, bushing temperature, shaft speed, and torque are monitored during the test, and wear of both the bushing and the shaft is measured after testing is completed (see the following photograph).



Measurements being recorded after testing with the bushing test rig.

Initially, PM300 bushings will be evaluated and compared with lower temperature, traditional bushing materials like graphite and porous bronze. The baseline PM304 composition is 60 wt% NiCr (a binder), 20 wt% Cr₂O₃ (a hardener), 10 wt% BaF₂/CaF₂ (a high-temperature lubricant), and 10 wt% Ag (a low-temperature lubricant). Future research efforts will include determining the effects of load, sliding speed, and temperature on tribological performance and, possibly, tailoring composition for specific applications. We expect that the availability of measured performance data will enhance the market penetration of PM300 technology.

Find out more about this research at <http://www.grc.nasa.gov/WWW/Oilfree/>

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